

REMARKS

The Examiner is thanked for the performance of a thorough search.

By this amendment, Claims 1-20 have been cancelled and Claims 21-40 have been added. Hence, Claims 21-40 are pending in this application. The amendments to the claims are made to (a) clarify the meaning of a cluster in formerly presented Claim 1, and (b) observe “proper dependent form claim numbering conventions” in the formerly presented dependent claims 11-20. All issues raised in the Office Action mailed April 4, 2006 are addressed hereinafter.

CLAIMS 11-20 HAVE BEEN AMENDED TO OVERCOME CLAIM OBJECTIONS

To address the concerns raised by the Office Action regarding “proper dependent form claim numbering conventions,” Claims 1-20 have been cancelled herein and reintroduced as Claims 21-40. The ordering of the claims has been changed. Dependent computer-readable medium claims (formally appearing as Claims 11-20) now appear immediately after the method claim upon which they depend. Consequently, it is respectfully submitted that the objection to Claims 11-20 for not observing “proper dependent form claim numbering conventions” has been overcome.

CLAIMS 1-20 ARE DIRECTED TO STATUTORY SUBJECT MATTER

The Office Action appears to base, at least in part, the rejections to Claims 1-20 made under 35 U.S.C. § 101 on the rationale that Claims 1-20 are directed toward a signal. However, none of the pending claims are directed towards a signal. Instead,

Claims 21, 23, 25, 27, 29, 31, 33, 35, 37, and 39 claim a method, and Claims 22, 24, 26, 28, 30, 32, 34, 36, 38, and 40 claim a computer-readable storage medium. A method is a process, and a computer-readable storage medium is an article of manufacture. A process and an article of manufacture are both expressly recognized as being patentable subject matter under 35 U.S.C. § 101.

To be statutory under 35 U.S.C. § 101, the result of a claim must be useful, tangible, and concrete. With the exception of the requirement that the result of the invention be tangible, Applicants are not aware of any other tangibility requirement relating to 35 U.S.C. § 101. The Patent Office is invited to identify any legal authority that supports the position that 35 U.S.C. § 101 includes a requirement that an embodiment of the invention be tangible¹. For example, other than alleging that formerly presented Claims 11-20 are directed towards a computer-readable medium that may correspond to a transmission media that cannot be touched or perceived, the Patent Office has not identified any legal authority to support the rejection made under 35 U.S.C. § 101.

Notwithstanding the fact that the rejection under 35 U.S.C. § 101 lacks a proper basis in law, the rejection also relies upon a premise that is factually incorrect. The Office Action states that acoustic or light waves, such as those generated during radio-wave and infra-red data communications, are not capable of being touched or perceived. However, it is precisely because acoustic waves may be touched or perceived by the human ear that humans are able to hear. For example, acoustic waves cause tiny bones in the middle ear of a human to vibrate, in turn causing nerve impulses, which enable a

¹For example, 35 U.S.C. § 101 states that a process is one of the four statutory classes of patentable subject matter, but yet a process is not tangible. Therefore, it is clearly incorrect to say that an invention must be tangible to qualify as patentable subject matter.

human to perceive sound waves, to be generated and received by the brain. Also, Applicants respectfully submit that anyone who has experienced a sun burn would disagree that light waves are incapable of being touched or perceived.

Moreover, modern computers are just as capable of reading instructions from transmission media as they are from storage media. For example, modern computers routinely include wireless interfaces that allow them to read instructions carried on wireless communications links. From the perspective of a computer, a transmission medium, such as a wireless communications link or an optical wave, is no less tangible than a storage medium, such as a hard disk. Certainly, data carried over a transmission medium may be touched or perceived, otherwise wireless networks could not exist. For example, cell phones enable voice data to be exchanged over a wireless transmission medium. If a cell phone could not perceive the voice data received over the wireless transmission medium, then cell phones would not work. It is therefore respectfully submitted that even if 35 U.S.C. § 101 is interpreted to include a tangibility requirement, that this requirement is satisfied by the pending claims.

By this amendment, the computer readable medium claims (i.e., the formerly presented Claims 11-20 which are now presented as the even numbered pending claims) have been amended to recite “computer-readable storage medium.” The Patent Office has issued over 5,000 patents that recite at least one claim directed towards a computer-readable storage medium. For example, issued U.S. Patents 7,065,755, 7,065,740, and 7,065,715 each recite at least one claim directed towards a computer-readable storage medium. Moreover, a computer-readable storage medium is clearly an article of manufacture, which is one of the four statutory categories of patentable subject matter under 35 U.S.C. § 101. The amendments to Claims 22, 24, 26, 28, 30, 32, 34, 36, 38, and 40 are made to clarify that a computer-readable storage

medium stores one or more sequences of instructions may be executed by one or more processors of a machine. The amendments to Claims 22, 24, 26, 28, 30, 32, 34, 36, 38, and 40 are not made to disclaim any embodiments where instructions are transmitted or received over a transmission media prior to being stored on the computer-readable storage medium.

For the foregoing reasons, withdrawal of the rejection of Claims 22, 24, 26, 28, 30, 32, 34, 36, 38, and 40 under 35 U.S.C. § 101 for allegedly being directed to non-statutory subject matter under 35 U.S.C. § 101 is respectfully requested.

THE PENDING CLAIMS ARE PATENTABLE OVER THE CITED ART

Claims 1-4 and 11-14 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 6,324,533 (hereinafter *Agrawal*). Claims 5-10 and 15-20 were rejected under 35 U.S.C. § 103(a) as allegedly being obvious over *Agrawal* in view of *High Performance Mining of Maximal Frequent Itemsets* (hereinafter *Grahne*). The rejections are respectfully traversed.

As explained above, the claims have been renumbered to observe “proper dependent form claim numbering conventions” in the formerly presented dependent claims 11-20. The below table illustrates, for each formerly presented claim, the new claim number to which it corresponds.

Former Claim Number	New Claim Number
1	21
2	23
3	25
4	27
5	29
6	31
7	33
8	35
9	37

10	39
11	22
12	24
13	26
14	28
15	30
16	32
17	34
18	36
19	38
20	40

Each of the pending claims recites at least one element that is neither disclosed, taught, nor suggested by either *Agrawal* or *Grahne*, taken individually or in combination.

CLAIM 21

Claim 1 has been amended to be recited as Claim 21 to clarify the meaning of a cluster.

Claim 21 recites:

“A method for performing a frequent itemset operation, the method comprising the steps of:
 performing the frequent itemset operation in a plurality of phases, wherein each phase is associated with combinations that have a particular number of items;
during at least one phase of the plurality of phases, performing the steps of
 determining candidate combinations that are to be evaluated during the phase;
grouping the candidate combinations into clusters, wherein each cluster corresponds to a common combination of items, and wherein all candidate combinations in a given cluster include the common combination of items associated with the cluster; and
 processing said candidate combinations, based on said clusters, to determine whether the candidate combinations satisfy a frequency criteria associated with said frequent itemset operation.” (emphasis added)

At least the above-bolded portions of Claim 21 are not disclosed, taught, or suggested by *Agrawal*.

Claim 21 is directed towards an approach for performing a frequent itemset operation.

According to the approach of Claim 21, the frequent itemset operation is performed in a plurality of phases. During at least one phase of the plurality of phases, candidate combinations that are

to be evaluated are determined, and grouped into clusters. Each cluster corresponds to a common combination of items, and all candidate combinations in a given cluster include the common combination of items associated with the cluster. The candidate combinations are then processed, based on the clusters, to determine whether the candidate combinations satisfy a frequency criteria associated with the frequent itemset operation.

On the other hand, while *Agrawal* describes an approach for performing a frequent itemset operation, *Agrawal* lacks any teaching or suggestion of anything analogous to a cluster as claimed. As a result, several elements of Claim 21 are not shown by *Agrawal*.

To illustrate, *Agrawal* recites the element of “during at least one phase of the plurality of phases, performing the steps of … grouping the candidate combinations into clusters, wherein each cluster corresponds to a common combination of items, and wherein all candidate combinations in a given cluster include the common combination of items associated with the cluster.” The portion of *Agrawal* cited to show this element (Col. 5, lines 41-47) merely states, *in toto*:

The candidate generation procedure ensures that C_k is a superset of the set of all frequent k-itemsets. The algorithm builds a specialized hash-tree data structure in memory out of C_k . Data is then scanned in the support counting phase. For each transaction, the algorithm determines which of the candidates in C_k are contained in the transaction using the hash-tree data structure and increments their support count. At the end of the pass, C_k is examined to determine which of the candidates are frequent, yielding F_k . The algorithm terminates when F_k or C_{k+1} becomes empty.

The above-cited portion of *Agrawal* lacks any teaching or suggestion of grouping the candidate combinations into clusters during a phase of a frequent itemset operation. For example, nothing in *Agrawal* is analogous to, during a phase of a frequent itemset operation, grouping candidate combinations in a cluster that corresponds to a common combination of items, and where all

candidate combinations in a given cluster include the common combination of items associated with the cluster. At best, the above-portion of *Agrawal* discusses an approach for determining whether a candidate combination meets certain frequency criteria during a phase of a frequent itemset operation; however, nothing in the above-portion of *Agrawal* suggests grouping candidate combinations into clusters during a phase of a frequent itemset operation. Consequently, the above-bolded element cannot be disclosed, taught, or suggested by *Agrawal*. If the Office disagrees, the Office is respectfully invited to particularly identify which portion of *Agrawal* allegedly is analogous to a cluster as claimed.

As at least one element is not disclosed, taught, or suggested by *Agrawal*, it is respectfully submitted that Claim 21 is patentable over the cited art and is in condition for allowance.

CLAIM 35

Claim 8 has been represented as new Claim 35 to observe “proper dependent form claim numbering conventions.”

Claim 35 recites:

“A method for performing a frequent itemset operation, the method comprising the steps of:
performing the frequent itemset operation in a plurality of phases, wherein each phase is associated with combinations that have a particular number of items;
during at least one phase of the plurality of phases, performing the steps of
determining candidate combinations that are to be evaluated during the phase;
processing said candidate combinations to determine whether the candidate combinations satisfy a frequency criteria associated with said frequent itemset operation, wherein the step of processing the candidate combinations includes generating bitmaps for the candidate combinations;
and
using an index on non-volatile memory to store a set of bitmaps that are generated during said at least one phase; and
during a subsequent phase of said plurality of phases, performing the steps of
retrieving bitmaps from said index into volatile memory; and

using the bitmaps retrieved from said index to generate bitmaps for candidate combinations of said subsequent phase.” (emphasis added)

At least the above-bolded portions of Claim 35 are not disclosed, taught, or suggested by *Agrawal* or *Grahne*, either individually or in combination.

The Office Action acknowledges certain shortcomings of *Agrawal*, namely that *Agrawal* lacks any teaching or suggestion of any use of a bitmap. For example, the Office Action states:

Agrawal et al. does not explicitly indicate using an index on non-volatile memory to store a set of bitmaps that are generated during said at least one phase; and during a subsequent phase of said plurality of phases, performing the steps of retrieving bitmaps from said index into volatile memory; and using the bitmaps retrieved from said index to generate bitmaps for candidate combinations of said subsequent phase. (page 10 of Office Action).

In view of the shortcomings of *Agrawal*, the Office Action relies upon *Grahne* to show the above-bolded elements of Claim 35. However, while *Grahne* does discuss bitmaps, *Grahne* lacks any teaching or suggestion of an index to store a set of bitmaps. As a result, *Grahne* cannot disclose, teach, or suggest the above-bolded elements of Claim 35.

For example, Claim 35 recites “during at least one phase of the plurality of phases, performing the steps of... using an index on non-volatile memory to store a set of bitmaps that are generated during said at least one phase.” However, the portion of *Grahne* cited to show this element (Page 2, introduction, paragraph 5) lacks any discussion of even the concept of an index, let alone containing a discussion of using an index to store a set of bitmaps that are generated during said at least one phase. If the Office disagrees, the Office is respectfully invited to particularly identify the portion of *Grahne* that discusses the concept of an index. Consequently, *Grahne* cannot disclose, teach, or suggest this element.

Grahne also recites the element of “during a subsequent phase of said plurality of phases, performing the steps of retrieving bitmaps from said index into volatile memory.” The same portion of *Grahne* cited to show the prior element is also cited to show this element. However,

as this portion lacks any discussion of the concept of an index, the cited portion of *Grahne* cannot disclose, teach, or suggest this element.

Grahne also recites the element of “using the bitmaps retrieved from said index to generate bitmaps for candidate combinations of said subsequent phase.” The same portion of *Grahne* cited to show the prior element is also cited to show this element. However, as this portion lacks any discussion of the concept of an index, the cited portion of *Grahne* cannot disclose, teach, or suggest this element.

As at least one element is not disclosed, taught, or suggested by either *Agrawal* or *Grahne*, it is respectfully submitted that Claim 35 is patentable over the cited art and is in condition for allowance.

CLAIMS 22-34 AND 36-40

Claims 22-34 and 36-40 all depend from either Claim 21 or Claim 35 and include all of the limitations of the claim from which they depend. It is therefore respectfully submitted that Claims 22-34 and 36-40 are patentable over the cited art for at least the reasons set forth herein with respect to the claim to which they depend. Furthermore, it is respectfully submitted that Claims 22-34 and 36-40 recite additional limitations that independently render them patentable over the cited art, but in view of the fundamental differences over the cited art already identified for each of Claims 22-34 and 36-40, for brevity Applicants reserve the right to discuss those additional limitations at a later time.

CONCLUSION

It is respectfully submitted that all of the pending claims are in condition for allowance and the issuance of a notice of allowance is respectfully requested. If there are any additional charges, please charge them to Deposit Account No. 50-1302.

The Examiner is invited to contact the undersigned by telephone if the Examiner believes that such contact would be helpful in furthering the prosecution of this application.

Respectfully submitted,

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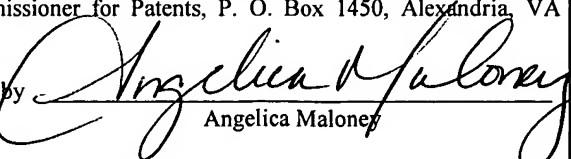
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